Industry Skills Standards

Jobs and Skill Requirements
for Entry-Level Workers
2000-2005

Environmental, Natural Resources & Agriculture

A project of the
Connecticut Business & Industry Association,
in collaboration with the
School-to-Career Partnership
of the State Departments of Education, Higher Education and Labor.

CONNECTICUT LEARNS
School-to-Career System

CBIA
Connecticut
Business & Industry
Association

An Introduction to the
Environmental, Natural Resources, and Agriculture Cluster

The "Environmental, Natural Resources, and Agriculture" cluster includes jobs in which workers improve the indoor and outdoor environment, reduce waste and by-products, manage forests and land, produce food from the land and sea, and nurture and care for animals.

The number of jobs in these areas continues to escalate. In fact, this is a high-growth area, particularly in jobs that require monitoring air, water and land quality and controlling environ-mental risks. Almost all manufacturing businesses in the state — including (a) the utilities, (b) pharmaceutical, chemical, metallurgical and fabricating companies, and (c) municipalities — need assistance in complying with the increasing number of state and federal environmental laws and regulations. Both indoor and outdoor environments require evaluation, remediation and maintenance. Risk assessment of wastes, and their control and reduction, are becoming of vital importance, as is the management and disposal of by-products of the industries mentioned above.

Farming and fishing industries are also part of the Connecticut labor market, with specialized farms producing fruit, vegetables and plants, and raising animals. Veterinarians and their assistants are needed to take care of an increasing animal population.

Job opportunities in the agricultural and horticultural fields are excellent. Currently there is a shortfall of recent college graduates with degrees in this growing industry. Excellent opportunities exist for horticulture specialists, pest management specialists and technicians, and food scientists. Many opportunities also exist for people trained in other clusters to work in this field, such as managers and financial specialists.

About 60 percent of the available graduates working in Agriculture/ Horticulture will likely come from outside these fields.

The high school academic background needed for most jobs in this cluster should emphasize courses in biology, chemistry, physical sciences and math, as well as interpersonal skills. The Regional Vocational Agriculture Centers already offer courses in environmental science and modern methods of agriculture and animal care, which can serve as a basis for the high school curriculum as well. In addition, computer literacy is essential.

Many of these jobs take place in owner-operated businesses, manufac-turing, consulting , and service businesses, and farming where it is important to understand how a small business operates. Employees are usually directly in contact with customers. Because 99 percent of Connecticut business establishments employ less than 500 persons, it may be necessary to wear many job hats, and general knowledge and flexibility are important attributes.

As with the manufacturing sector, some entry-level jobs in farming, commercial fishing, and landscape and lawn care might be appropriate for high school graduates, but most jobs in this cluster would require people with at least an associate's degree or specialized training. Throughout this cluster, specialized training and certifications are required by state and federal regulation.

Working in this cluster often appeals to people who enjoy a challenge, who like being outdoors, who like to understand in detail how systems work, who are comfortable having to frequently work on their own, who feel strongly about protecting the environment and improving the quality of life, who like collecting data and using scientific principles to solve problems. People who like animals, who

enjoy working with natural systems or nurturing growth, or who are patient enough to follow through on projects that may take months or even years to complete would also enjoy many of these jobs.

Something to Consider

This sector depends on workers with both technical and interpersonal skills who are flexible enough to meet the challenges of a changing market and regulatory arena. These workers have an ongoing need to hone technical and interpersonal skills in order to provide personalized service to clients, both internal and external, who often do not under-stand the regulatory demands. These jobs provide opportunities to be an entrepreneur, and to develop new systems, methods or products to meet changing objectives. This kind of work is best done by the self-starter, the independent worker who rises to the challenge and is willing to work long hours in order to reap long-term rewards.

Computer technology is becoming a critical skill for these jobs, whether the work is in design, sche-duling, chronicling and diagnosing data, or systems parameters. Much routine regulatory reporting of data can now be done electronically, so computer skills add to a person's marketability.

Some Examples of What a Student Might Do

Environmental field technicians spend considerable time taking samples or evaluating and documenting existing situations. This may involve taking indoor air samples, taking water or soil samples, making sound-level measurements, chronicling events, observing animal movements or working as an assistant to an engineer or scientist. The ability to be observant and precise and to carefully document data is essential. The work may be performed during adverse conditions — for instance, during winter cold, summer heat or storms.

Agriculture/horticulture technicians are in perhaps the broadest category in this job cluster. These technicians work in natural systems, growing, nurturing, and harvesting plant, animal or sea life. The job involves patience, caring and sensitivity to life and what nurtures it. The job also involves much preservation and maintenance. These technicians must have good zoological, botanical, agricultural or aquacultural knowledge. Much of the work involves the outdoors, regardless of the weather, or is done in laboratory settings.

Instrument technicians service and calibrate recording and control equipment. Such equipment can range from continuous emissions monitors on stacks up to 500 feet high, to treatment control equipment such as pH meters and flowmeters. In addition, these technicians may also perform laboratory analyses requiring the use of advanced instruments used to evaluate gas, water or soil samples. Such work requires patience and the ability to determine the correct methodologies to employ. Precise and accurate data recording is a must. The ability to precisely follow sequences of instruction is essential.

Regulatory information technicians perform two vital functions. The first is to chronicle regulatory developments and programs that govern the operations of the technician's employer. The second is to assemble the data required for regulatory requirements, which must be submitted in an accurate and timely manner. Attention to detail is an asset, along with computer knowledge and interpersonal skills, which are necessary to obtain information from many sources at various management and operating levels. (See "Regulatory compliance technicians.")

Treatment process technicians remedy existing problems — that is, already-created pollution.
They operate, troubleshoot and maintain the chemical, physical and biological processes that are used to treat particular waste streams or contaminated media. Data-recording ability, process knowledge, attention to detail, and attentiveness are critical attributes. Often such work entails working on roofs, in

basements, or in the heat of summer or cold of winter.

Regulatory compliance technicians take the information generated by regulatory information technicians and determine what remediation is necessary. This evaluation may include field audits to inspect processes, storage areas or records, or may involve the mathematical computation of emissions or effluent loading rates. Such tasks require attention to detail, knowledge of regulations, the ability to interpret regulatory requirements and the ability to perform mathematical computations in a precise manner. These technicians merge regulatory criteria and field data to create a data package that meets regulatory compliance needs.

Site remediation technicians work with highly toxic and hazardous materials. They may be exposed to materials both benign and carcinogenic. Specific training is necessary to perform these jobs. These technicians may respond to releases of unknown nature or may remediate specific situations such as PCB-laden soil. Attention to detail, the ability to follow precise protocols, and the ability to listen and understand under stressful conditions are all necessary attributes. Work is usually performed outside, in all weather and at all times of the day.

ENVIRONMENTAL, NATURAL RESOURCES, AND AGRICULTURE CLUSTER

JOB CATEGORIES AND SELECTED JOB TITLES

Environmental, natural resources, and agriculture professionals have identified the job categories and titles they project will be in demand over the next five years. Education level requirements are indicated for each job requirement so those students can plan their coursework accordingly. However, there is some flexibility within these educational guidelines. What is checked represents the minimum amount of education required.

Environmental Professionals

Primary Function: Collect and prepare samples and data, take measurements, calibrate equipment and oversee remediation site. Environmental engineers develop systems and process designs for environmental services, such as soil and water decontamination services, air and water pollution control services, chemical and hazardous waste treatment, site cleanup, and other health and safety services.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Agricultural Engineer			X	
Chemical Engineer⌘*				X
Civil Engineer*			X	
Design Engineer⌘*			X	
Energy Conservation Engineer⌘			X	
Environmental Engineer⌘			X	
Environmental Measurements and Analysis Technician		X		
Field Sampling Technician		X		
Geophysical Engineer⌘				X
Hazardous and Solid Waste Engineer			X	
Inland-Wetland/Soil Conservation Forestry Technician		X		
Lead/Asbestos/PCB Technician		X		
Loss Control Engineer⌘			X	
Mechanical Engineer⌘*			X	
Natural Resources Engineer⌘			X	
Ocean Engineer⌘				X
Pollution Control Engineer*				X
Risk Engineer⌘			X	
Sanitary Engineer⌘				X

* *= appears in another cluster* ⌘ *= certification required*

Instrument Technician

Primary Function: Use instruments or chemical analysis to measure operational/environmental parameters.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Air Quality Analyst		X		
Instrumental/Optical Lab Analyst		X		
Instrument Technician		X		
Soil Solids Analyst		X		
Water Quality Analyst		X		
Wet Chemical Lab Analyst		X		

Regulatory Information Technician

Primary Function: Search out information and supply compliance and operation data to customer as needed, sort and classify data, run check on databases.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Database Specialist		X		
Reporting Specialist		X		

Regulatory Compliance Technician

Primary Function: Compare operation with regulations and perform subsequent reporting.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Compliance Auditor		X		
Enforcement Inspector		X		
Field Inspector		X		
Health and Safety Inspector (OSHA, DOT, EPA)		X		
Risk Management Technician		X		
Sanitarian		X		

* *= appears in another cluster*

⌘ *= certification required*

Treatment Process Technician

Primary Function: Use chemicals or bugs to treat process streams, waste streams and hazardous materials.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Biotreatment Technician		X		
Hazardous Materials Operation Technician (Generator/TSDF)		X		

Agricultural/Horticultural/Animal Care

Primary Function: Maintain and develop the ecosystem through agricultural mechanics, plant science, animal science and use of natural resources. Plan, organize and direct activities involved in managing a farm or other agricultural enterprise (for example, a tree farm), including purchasing new equipment, maintaining inventories and agricultural databases, training employees , and complying with state and federal regulations.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Agricultural Biochemist			X	
Agricultural Biotechnologist			X	
Agricultural Economist			X	
Agricultural Engineer			X	
Agricultural Technician		X		
Animal Care/Veterinary Technician		X		
Animal Scientist			X	
Aquaculturalist				X
Aquaculture/Hydroponics Technician		X		
Biological Technician		X		
Extension Agent				X
Financial Manager				X
Food Scientist			X	
High School/Post-Secondary School Educator⌘				X
Horticultural Technician		X		
Horticulturist			X	
Landscape Designer/Nursery Greenhouse Professional			X	
Natural Resources Technician		X		
Nutritionist⌘*				X
Pesticide Herbicide/Fertilizer Applicator		X		
Veterinarian (requires 4 years beyond BS)⌘				X

* *= appears in another cluster*

⌘ *= certification required*

Scientists and Technologists

Primary Function: Study air, water, soil, plants, animals, and chemical composition and contaminants of the environment. Interpret and integrate new research and information to make recommendations for action or further study. Devise methods of handling, storing, and disposing of hazardous waste materials, and/or minimizing waste generation (pollution prevention) in compliance with OSHA, EPA and company procedures.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Air Quality Technologist⌘			X	
Air, Waste, and Water Analyst⌘			X	
Animal Reproduction Physiologist				X
Biochemist				X
Biologist (specializing in wildlife or fisheies)				X
Botanist				X
Certified Site Professional (federal/state program in place)⌘			X	
Compost Scientist			X	
Conservation Scientist			X	
Ecologist				X
Entomologist				X
Environmental Analyst			X	
Environmental Auditor⌘			X	
Environmental Laboratory Technologist⌘			X	
Forest Manager				X
Geographic Information Specialist				X
Geologist, Geophysicist⌘				X
Horticultural Scientist				X
Hydrogeologist/Hydrologist				X
Marine Biologist				X
Oceanographer				X
Pest Management Specialist⌘				X
Pollution Prevention Specialist⌘			X	
Recycling and Recovery Specialist⌘			X	
Risk and Hazard Evaluator			X	
Soil Scientist				X
Toxicologist⌘*				X

* = *appears in another cluster*

⌘ = *certification required*

Site Remedian Technician

Primary Function: Remove toxic material from a hazardous waste site.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
HazMat Cleanup Technician		X		
HazMat Response Technician		X		

Health and Safety Specialists

Primary Function: Establish and maintain health and safety standards in the workplace, based on scientific knowledge and legal requirements.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Acoustical Engineer⌘			X	
Asbestos, Abatement Personnel (state, federal, statutory)⌘			X	
Chemical Waste and Water Analyst⌘			X	
Ergonomist			X	
HazMat Specialist			X	
Health Physicist⌘				X
Industrial Health Nurse			X	
Industrial Hygienist			X	
Lead Abatement personnel (technologist/auditor/supervisor)⌘			X	
Occupational Health and Safety Technologist⌘*			X	
Safety and Health Manager			X	
Safety Engineer⌘			X	
Sanitarian*			X	

* = *appears in another cluster*

⌘ = *certification required*

Sales and Marketing

Primary Function Sell and market goods and services that require a technical knowledge in the environmental, natural resources and agricultural fields.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Export Sales Manager*			X	
Food System Salesperson*			X	
International Sales Officer*			X	
Market Analyst*			X	
Purchasing Manager*			X	
Retail Manager*			X	
Sales Engineer**			X	
Wholesale Manager			X	

Legal, Regulatory and Financial Professionals

Primary Function*:* Provide legal and financial advice pertaining to the environment, natural resources and agriculture. Interpret and prepare for changes in international, federal and state laws, and actively lobby to protect the interests of organizations, communities or consumers affected by these laws.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Agricultural Economist			X	
Attorney (expertise in environment, labor, export & trade)*				X
Credit Analyst			X	
Economist*			X	
Financial Analyst*			X	
Government Relations Officer*			X	
Policy Analyst*			X	
Risk Manager*				X

* *= appears in another cluster*

⌘ *= certification required*

Environmental, Natural Resources, and Agriculture (High School or Associate's Degree)

Technical Skills	Environmental Professionals	Instrument Technician	Regulatory Technician (Information)	Treatment Technician	Regulatory Technician (Compliance)	Agriculture, Horticulture, Animal Care	Site Remediation Techician
Instructions							
Follow complex instructions on Material Safety Data sheets and their pertinent health and safety documentation.	X	X	X	X	X	X	X
Discern step sequence in general instructions.	X		X	X	X	X	X
Research:							
Locate and obtain information in federal, state and local statutes, regulations and technical references.	X		X		X	X	
Obtain, retrieve and order data and information.	X	X	X	X	X	X	X
Relate descriptive language to technical concepts.	X	X	X	X	X	X	X
Analysis:							
Comprehend the meaning of technical terminology.	X	X	X	X	X	X	X
Interpret signs, symbols and labels. Examples: HMIS, NFPA, OSHA hazard markings.	X	X	X	X	X	X	X
Interpret a variety of maps, process flow diagrams, logic/decision diagrams, instrument circuit diagrams, blueprints and building drawings.	X	X	X	X	X	X	X
Interpret statutes, regulations and technical references.			X		X	X	X
Reports, Letters and Memos:							
Develop simple technical reports.	X	X	X		X	X	X
Structure report by topic per paragraph.	X	X	X		X	X	X
Write simple and logical instructions/sequences.	X	X	X	X	X	X	X

Environmental, Natural Resources, and Agriculture (High School or Associate's Degree)

Technical Skills	Environmental Professionals	Instrument Technician	Regulatory Technician (Information)	Treatment Technician	Regulatory Technician (Compliance)	Agriculture, Horticulture, Animal Care	Site Remediation Techician
Log and Records:							
Describe physical, chemical and operation situations in clear language.	X	X	X	X	X	X	X
Keep accurate business records.						X	
Graphics:							
Use a graphic organizer effectively.	X	X	X	X	X	X	
Processing:							
Use a scientific calculator.	X	X	X	X	X	X	X
Interpret columnar chart data in mathematical terms.	X		X	X	X	X	X
Spot inconsistencies in a series.	X	X	X	X	X	X	X
Interpret meters and scales.	X	X	X	X	X	X	X
Physical Situations:							
Apply scales to maps, diagrams and drawings.	X	X	X	X	X	X	X
Discern spatial relationships and visualize in three dimensions.	X	X		X	X	X	X
Use basic vector concepts.	X	X		X	X	X	
Interpret time-dependent mathematical relations.	X	X		X	X	X	X
Listening:							
Wait and think before answering.	X	X	X	X	X	X	X
Remember by listening and watching.	X	X	X	X	X	X	X
Analyze what's being said for accurate content.	X	X	X	X	X	X	X
Use critical thinking/questioning to assess content.	X	X	X	X	X	X	X
Evalute stated basis for decisions.	X	X	X	X	X	X	X
Formulate intelligent questions.	X	X	X	X	X	X	X
Obtain accurate answers.	X	X	X	X	X	X	X
Validate information before passing it along.	X	X	X	X	X	X	X

Environmental, Natural Resources, and Agriculture (High School or Associate's Degree)

Technical Skills	Environmental Professionals	Instrument Technician	Regulatory Technician (Information)	Treatment Technician	Regulatory Technician (Compliance)	Agriculture, Horticulture, Animal Care	Site Remediation Techician
Logic, problem-solving ,analytical:							
Use sequential logic, make simple flow diagrams.	X	X	X	X	X	X	X
Make organized subsets/tabulate information.	X	X	X	X	X	X	X
Interpret trends.	X	X	X	X	X	X	X
Apply cause-and-effect principles.	X	X	X	X	X	X	X
Apply correlation equations and principles.	X	X	X	X	X	X	X
Apply deductive and inductive reasoning to situations.	X	X	X	X	X	X	X
Make working diagrams of physical situations.	X	X	X	X	X	X	X
Conceptualize physical and chemical problems on paper.	X	X	X	X	X	X	X
Organize problems for diagnosis.	X	X	X	X	X	X	X
Apply background and academic knowledge to a problem.	X	X	X	X	X	X	X
Interpret exponential and logarithmic relations.	X	X	X	X	X	X	X
Detect faulty data.	X	X	X	X	X	X	X
Computer Skills:							
Use drawing/drafting program.	X	X	X		X	X	X
Interface measuring instrument with computer.	X	X	X	X	X	X	X

Technical/Scientific Skills							
Practical Sciences:							
Apply non-stoichiometric real-world reaction concepts.	X	X		X	X	X	X

Environmental, Natural Resources, and Agriculture (High School or Associate's Degree)

Technical Skills	Environmental Professionals	Instrument Technician	Regulatory Technician (Information)	Treatment Technician	Regulatory Technician (Compliance)	Agriculture, Horticulture, Animal Care	Site Remediation Techician
Apply safe handling of chemicals/fire hazard concepts.	X	X		X	X	X	X
Apply basic fluid flow concepts, mass flow and contaminant flow.	X			X		X	X
Apply temperature, pressure and volume relation concepts.	X	X	X	X	X	X	X
Use basic physical chemistry measurement instruments.	X	X	X	X	X	X	X
Operate, calibrate and maintain basic chemical and physical measurement instruments.	X	X	X	X	X	X	X
Apply elementary chemical sampling and testing.	X			X	X	X	X
Demonstrate basic wetlands classification knowledge.	X				X	X	X
Understand basic chemical reactions and effects concepts.	X			X	X	X	X
Understand basic chemical properties and use concepts.	X	X	X	X	X	X	X
Use basic ecology principles.	X			X	X	X	X
Understand basic hydrogeology concepts. Examples: surface and groundwater flow.	X			X	X	X	X
Use basic cycles concepts. Examples: hydrologic cycle, carbon food chain.	X			X	X	X	X
Use basic contours and gradients concepts. Examples: mapped surfaces, directed fluid flow.	X		X	X	X	X	
Use basic knowledge of animal care , e.g., animal facilities, diseases and disease prevention.						X	
Use basic zoology concepts.	X				X	X	X
Use basic toxicology concepts.	X		X	X	X	X	X

Environmental, Natural Resources, and Agriculture (High School or Associate's Degree)

Technical Skills	Environmental Professionals	Instrument Technician	Regulatory Technician (Information)	Treatment Technician	Regulatory Technician (Compliance)	Agriculture, Horticulture, Animal Care	Site Remediation Techician
Use basic ecology principles.	X			X	X	X	X
Apply basic scientific method.	X			X		X	X
Know how machines are built and how they work.		X		X	X	X	
Know residuals, contaminants and by-products from processes.	X		X	X	X	X	X
Principles of measuring instruments.		X	X	X	X	X	
Know basic production processes.				X	X	X	X
Understand basic chemical sampling and testing principles.	X			X	X	X	X
Know basic environmental regulatory concepts.	X		X		X	X	X
Know basic electricity concepts.		X		X	X	X	X
Know basic gas and liquid flow control concepts.	X	X		X	X	X	X